LEARNING CURVES FOR FIBEROPTIC INTUBATION

A. Apostol, N. Arhana, B. Hu, D. Kuzmin, L. Li

Department of Anesthesiology, SUNY Downstate Medical Center, Brooklyn, New York

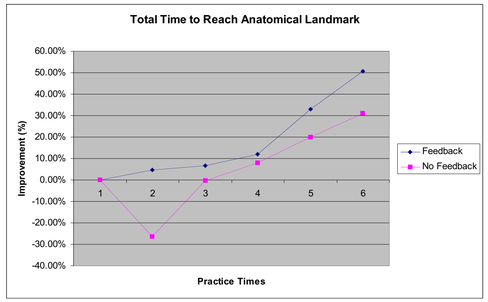
BACKGROUND

We explored the feasibility of utilizing DVD recordings of fiberoptic intubation performance by anesthesiology residents as a feedback tool. Our hypothesis is that acquisition of fiberoptic intubation skills will be improved with video feedback compared to skill acquisition without video feedback. In high performance training fields like sports, military, and aeronautics; this method has already been implemented as a successful teaching tool.

METHODS

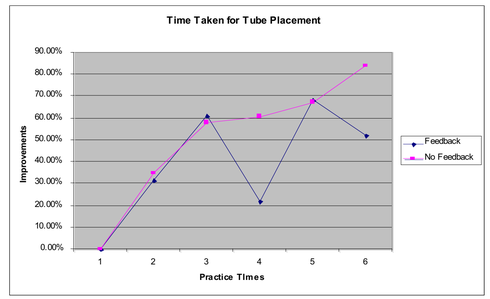
Two groups of randomly assigned residents performed fiberoptic intubation. After each case, each resident in group I (N=16), received video feedback. This enabled them to review each step of intubation using computerized video playback of recorded video for each fiberoptic intubation they performed (96 in total). Each session included coaching, with guidance on how to improve and avoid mistakes. The second group (N=16), performed 96 fiberoptic intubations without video feedback; however, video images were recorded for the purpose of data analysis.

Mallampati Class was considered to see whether there was a difference in time to perform fiberoptic intubation between different classes. Data was analyzed for statistically significant differences between the groups by Student's t test; the learning curves were then analyzed for proper design. Improvement in performance (%) was calculated for each fiberoptic intubation using the following formula: $(T_i - T_n)/T_i$ x 100% where T_i is time of initial intubation, T_n is the total time of the subsequent intubations. Finally, each group was divided equally into low performance group and high performance group after the first intubation to narrow the variability of innate skills possessed by the participants.



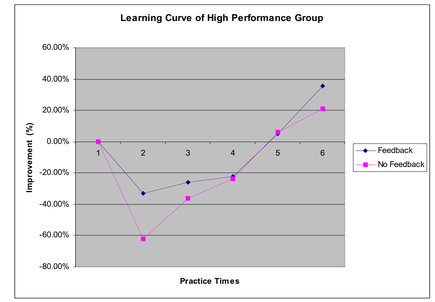
Learning curve represented by improvement of performance (total time to reach anatomical landmarks, including epiglottis, vocal cord and carina) over intubation practice times.

It seems residents learn to reach anatomical landmarks faster with feedback than without feedback

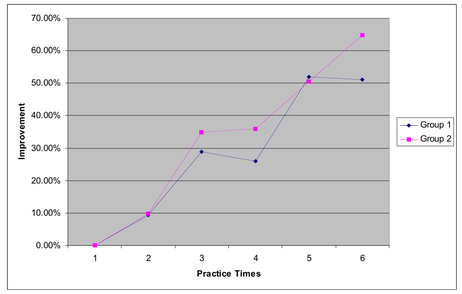


Learning curve represented by improvement of performance (time taken for tube placement) over intubation practice times.

It seems video feedback does not help improve the performance of tube placement.



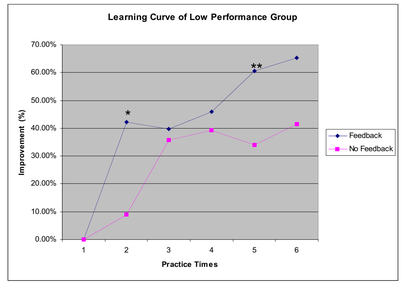
Learning curve of high performance group represented by improvement of performance (total time to reach anatomical landmarks, including epiglottis, vocal cord and carina). The mean initial performance of the group with feedback (n=5) is 30.4±4.83 seconds, and the group without feedback (n=5), 30.2±4.82 seconds.
No statistically significant difference between feedback group and no-feedback group.
For both feedback and no-feedback group, there is no significant improvement comparing the initial performance and subsequent practices ($p>0.05$, t-test).
Combined with the previous slide, it's indicated that the real improvement only took place in the low performance group. Video feedback helped learning, and again, only in the low performance group.



Learning curve represented by improvement of performance (total time) over intubation practice times. Group 1: with video feedback; Group 2: without video feedback. Combined previous two curves, in term of total time for intubation, two groups have similar learning curve.

Improvement of performance (%) was calculated as follows: Where T_1 is total time of the initial intubation, and T_n is the total time of the subsequent trials.

$$\frac{T_1 - T_n}{T_1} \times 100\%$$



Learning curve of low performance group represented by improvement of performance (total time to reach anatomical landmarks, including epiglottis, vocal cord and carina). The mean initial performance of the group with feedback (n=5) is 64±13 seconds, and the group without feedback (n=5), 61±27 seconds.
*:$p<0.1$; **:$P<0.05$, t-test of the difference between feedback group and no-feedback group.
For feedback group, all the improvements over initial performance of practice times 2 to 6 are statistically significant ($p<0.05$, t-test); for no-feedback group, all the improvements are significant except the 2nd try ($p<0.05$, t-test).

RESULTS

Time taken to reach the epiglottis was faster for Group I. Time taken to reach the vocal cords was faster in Group I; however, not statistically significant. The total time taken for fiberoptic intubation was faster for Group I.

Total time taken for fiberoptic intubation with varying airway class was analyzed with both groups; there was a statistically significant difference between class 2 and 3; however, there was no significant difference shown between class 1 and 2 or between 1 and 3. The learning curve represented by improvement of performance was higher in the group with video feedback. Low performance group improvement was statistically significant versus high performance group.

CONCLUSION

Overall our results indicate that video feedback is an innovative and successful teaching tool.

REFERENCES

1. Practice guidelines for management of the difficult airway. A report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway: *Anesthesiology* 2003; 98:1269-77
2. Cole AFD, Mallon JS, Rolbin SH, Ananthanarayan C: Fiberoptic intubation using anesthetized paralyzed, apneic patients. *Anesthesiology* 1996~84: 1101-6